



Sandia Canyon Wetland Evaluation and Strategies for its Management

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Introduction

Wetlands are important and unique habitats on the Pajarito Plateau. Sandia Canyon wetland has been providing a source of wildlife habitat, erosion control, and water retention dating back to at least the 1870s. A wetland evaluation has been conducted in upper Sandia Canyon to evaluate the changes in discharge flows and the size, extent, and quality of the wetlands. As part of DOE Orders for Wetland Protection, the Clean Water Act, and the general federal philosophy to reduce the loss of our nation's wetlands, a wetland evaluation was needed to determine if mitigation measures should be applied to Sandia Canyon to prevent wetland size reduction and reduction in wetland quality. This evaluation was prepared as a technical evaluation for the use of project planning within the TA-3 area. This evaluation included a photograph comparison, wetland field evaluation, the use of a wetland functional assessment model, flow information, and mitigation recommendations for different flow scenarios.

Wetland Importance

Wetlands are slow-moving hydrological systems and transitions between fully terrestrial and fully aquatic ecosystems. Wetlands need sufficient hydrology to induce soils capable of supporting plants suited for growing in saturated, anaerobic conditions. Functional wetlands offer a wide array of benefits including:

- erosion control
- storm and flood abatement
- water retention
- sediment and contaminant trapping
- water quality enhancement through bacterial metabolism, filtration, and sedimentation
- wildlife habitat
- aquatic productivity
- aquifer recharge
- aesthetic benefits
- educational and research opportunities



Description of Sandia Canyon

The head of Sandia Canyon is near the University House in Technical Area 3 (TA-03; Figure 1), and the canyon extends southeastward to the Rio Grande. The drainage basin is approximately 13.5 square kilometers (5.2 square miles). Industrial effluents from LANL activities maintain a year-round stream flow through the bottom of the canyon. The upper stream reach receives effluent discharge. Storm water runoff and snowmelt also contribute seasonally to the stream. A cattail wetland exists in the upper stream reach (Photo 1).

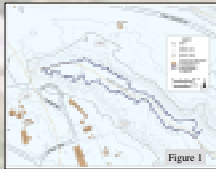


Figure 1



Photo 1

Discharge Flows from Industrial Effluents

Sandia Canyon has received industrial effluents for greater than 50 years. During this time, at least three major types of industrial effluent outfalls have contributed to the flow into the canyon, OIA (power plant), OIS (sanitary waste), and OSA (treated cooling water). In the mid-1990s, the sanitary waste was re-circulated through the power plant and discharged through the OIA outfall. Flows from the OIA and OSA outfalls are monitored throughout the year (Figure 2). Flows can fluctuate month to month and year to year. Currently, the amount of flow that discharges at any given time is not managed. There is increasing pressure to re-use discharge water and decrease the amount of water discharged into Sandia Canyon.

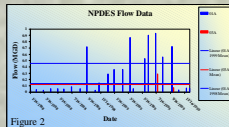


Figure 2

Photograph Comparison

During the late spring and early summer in 1990, the Biology Team set up photography stations in and around the Sandia Canyon wetland. Photographs were taken. In the fall of 2000, we revisited the 1990 photography stations and took 34 matching pictures. The pictures were compared to look at changes that had occurred over the last 10 years. Even though the pictures were taken at different seasons, several changes were evident.

1) Stream channel has incised.



2) Change of vegetation type - wetland to upland.



3) Increase in sedimentation.



Wetland Field Evaluation

In the summer of 2000, we conducted an evaluation of Sandia Canyon wetland to determine current size and extent. We evaluated the vegetation, soils, and hydrology within the wetland complex to determine the boundary of the wetland. Data from this evaluation were also used in a wetland functional assessment model.

Vegetation: A baseline was established on the outer south side of the wetland that was parallel to the watercourse. Transects were placed every 300 ft and were perpendicular. Vegetation was recorded every 10 ft along the transect. Plant species, percent cover, and wetland indicator status were recorded for each plot. Using the data collected, we determined if the dominant vegetation present at each plot was characteristic of a wetland community. Areas representing wetlands were flagged with survey flagging.



Soils: Using the baseline that was established for the vegetation, hydric soils were evaluated. Soils were evaluated at the same 300-ft interval as the vegetation. Hydric soil pits were dug at the farthest extent of wetland vegetation (based on the vegetation plot flags). If the pit was not found to have hydric soils, another pit was dug at the next plot of wetland vegetation. Soils were examined for color, texture, moisture, presence of mottles (contrasting color areas in the soil representing a reducing soil condition), and recent sediment fill deposits. Soils having hydric conditions were classified as wetland soils. Flagging from the vegetation plots was then moved or adjusted to the locations where both wetland plants and soils existed.

Hydrology: The hydrology was evaluated at each hydric soil pit. We examined hydrology by evaluating soil moisture, presence of freestanding water in the pit, water droplets on the walls of the pit and signs of drift lines and high water marks in the area. Hydrology observations were recorded with the hydric soil data. Flagging was adjusted to mark the location where all three wetland characteristics (plants, soils, and hydrology) were present.

Wetland Mapping: Using a Global Positioning System (GPS), we located the boundary that was formed by the survey flagging. At each survey flag we took differential GPS locations for three minutes. For areas in between flagging, we walked the area with differential GPS staying within the same vegetation zone that was determined at the previous soil pit. Periodically, we would take a soil core to assure the soil and hydrology character had remained constant. A map of the area was made with the new wetland spatial extent. Map 1 shows the new Sandia Canyon wetland boundary, the 1996 boundary, upland/wetland determination area (from hydric soil pits and vegetation plots) sites, and areas that have been de-watered.

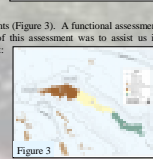


Figure 3

Functional Assessment Model

After completing the field evaluation we divided the wetland into 3 evaluation segments (Figure 3). A functional assessment model was used to evaluate and compare the different segments. The purpose of this assessment was to assist us in developing mitigation priorities and tasks. We evaluated 5 indices within each segment:

- maintenance of characteristic hydrology
- retention, conversion, and release of elements and compounds
- retention of particles
- maintenance of characteristic plant community
- maintenance of habitat structure

Within each index there were a series of functional variables. Each variable was scaled from 0.0 to 1.0 with 1.0 being the most desired condition. Functional variables were then combined through algebraic formulas to derive the function indices.

Functional Assessment Results

Function values for the 5 indices were calculated for each segment (Figure 4). For the five indices,

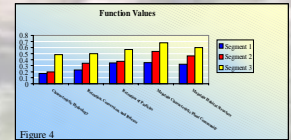


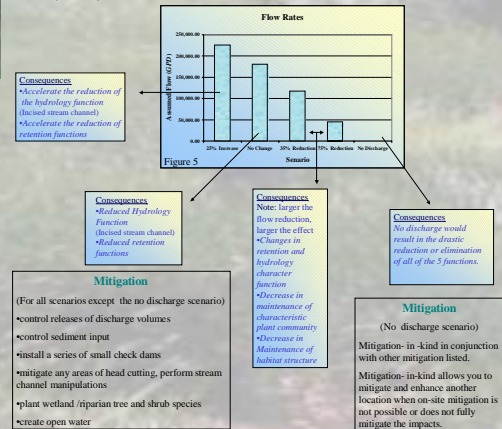
Figure 4

Segment 1 had the lowest functions calculated and Segment 3 had the highest function. The first two indices of function (characteristic hydrology and retention, conversion, and release of elements/compounds) had the highest potential for improvement in Segment 1. Their function values were the lowest and some of their contributing variables would respond well to mitigation and active management. These variables were:

- hydrology alteration
- sedimentation delivered to the wetland
- source area flow interception by the wetland
- vegetation density

The decrease in function in Segment 1 has resulted in a 48% reduction in wetland size and extent.

Based on the function values, we evaluated different discharge flow scenarios for wetland impacts and possible mitigation. Figure 5 shows the scenarios evaluated.



Consequences
• Accelerate the reduction of the hydrology function (incised stream channel)
• Accelerate the reduction of retention functions

Consequences
• Reduced Hydrology Function (incised stream channel)
• Reduced retention functions

Mitigation

- (For all scenarios except the no discharge scenario)
- control releases of discharge volumes
- control sediment input
- install a series of small check dams
- mitigate any areas of head cutting, perform stream channel manipulations
- plant wetland/riparian tree and shrub species
- create open water

Consequences
Note: larger the flow reduction, larger the effect
• Changes in retention and hydrology character function
• Decrease in maintenance of characteristic plant community
• Decrease in maintenance of habitat structure

Consequences
No discharge would result in the drastic reduction or elimination of all of the 5 functions.

Mitigation

(No discharge scenario)
Mitigation-in-kind in conjunction with other mitigation listed.
Mitigation-in-kind allows you to mitigate and enhance another location when on-site mitigation is not possible or does not fully mitigate the impacts.